

MODULE IV - GROUNDWATER MONITORING

IV.A. POST-CLOSURE GROUNDWATER MONITORING

- IV.A.1. The Permittee shall monitor groundwater in the uppermost aquifer as described in Attachment 1 and as described below, in a manner that will monitor the release of hazardous constituents from the RWMA in compliance with R315-8-6.
- IV.A.2. Solid waste management units (SWMUs) may be subject to provisions of this Module. The Executive Secretary shall determine which SWMUs may be subject to some or all of the provisions of this Module. The Permittee shall comply with the provisions of R315-8-6.12.
- IV.A.3. The Permittee shall follow all of the provisions listed under R315-8-6, Groundwater Protection as defined by the conditions of this permit. For the purposes of this permit, groundwater protection shall apply to the RWMA, the Groundwater Management Area (GWMA) and the Landfill Waste Management Area (LWMA).
- IV.A.4. The Point of Compliance for the RWMA is a vertical surface located at the hydraulically downgradient boundary of the RWMA landfill cell. The present compliance point monitor wells are listed in Condition IV.A.5. Maps showing the location of the compliance monitor wells for the RWMA are provided as Figures 1-2 and 1-4 in Attachment 1. Maps in Attachment 1 shall be updated if any well locations change in accordance with Condition I.D.2.
- IV.A.5. Monitor well RWMA-1 shall be considered hydraulically up-gradient for the RWMA and shall serve as background water quality and monitoring data. Monitor wells RWMA-2A and 3 shall serve as compliance point monitor wells along the western boundary of the RWMA landfill cell. RWMA-4 shall serve as the compliance point monitor along the southern boundary of the RWMA landfill cell. The entire monitor well system, identifying each compliance point monitor well location is presented on Figures 1-2 and 1-4 in Attachment 1. The Permittee may add monitor wells as specified in Conditions IV.D.6.

IV.B. REQUIRED PROGRAM

- IV.B.1 According to R315-8-6.8, the Permittee shall install and maintain a groundwater monitoring system as specified below:
- IV.B.1.a. Construction and maintenance of all permit-listed monitor wells shall be in accordance with Attachment 1 of the Permit; and
- IV.B.1.b. All monitor wells abandoned and no longer in use with respect to the monitoring program shall be plugged and abandoned in accordance with the well plugging and abandonment section of the most recent Administrative Rules for Water Well Driller's, Division of Water Rights, R655-4-12 (Attachment 3). Well plugging and abandonment methods and verification shall be submitted to the Executive Secretary within sixty (60) days from the date the monitor wells are removed from the monitoring program.
- IV.B.2. As indicated by R315-8-7, the post-closure care period for the RWMA is thirty (30) years from the September 2, 1997 effective date of this permit. If the groundwater protection standard in Condition IV.C is exceeded after thirty (30) years, the Permittee shall continue corrective action as specified in Condition V.B.

IV.C. INDICATOR PARAMETERS AND CONSTITUENTS

- IV.C.1. The Permittee shall sample RWMA monitor wells RWMA-1 through RWMA-4 as described in Attachment 1, for the parameters and constituents identified on Table IV-1.
- IV.C.2. The Permittee shall sample groundwater for the required parameters or constituents using the analytical methods listed in Table IV-1. Other than the use of an equivalent, updated method, if an alternate test method is to be proposed for use, the procedures in Condition I.F.13.b shall be followed. The Permittee shall also follow procedures specified in Condition I.D.2 for permit modifications.

Table IV-1
GROUNDWATER MONITORING PARAMETERS AND CONSTITUENTS

Parameter or Constituent	Test Method ^a	MDL ^b
General Parameters		
Calcium	6010B	100
Magnesium	6010B	100
Potassium	6010B	300
Sodium	6010B	300
Sulfate	300.0	100,000
Chloride	300.0	5,000
Alkalinity	310.1	2,000
Nitrate + Nitrite as N ^c	300.0	80
Fluoride	300.0	500
Sulfide	376.1	10,000
pH	150.1	Report Measured Value
Specific Conductance	120.1	Report Measured Value
Total Dissolved Solids	160.1	10,000
Oil and Grease	1664	2,200
Metals		
Arsenic	6010B	500
Cadmium	6010B	40
Chromium	6010B	50
Lead	6010B	40
Volatile Organics		
Benzene	8260B	5
Ethylbenzene	8260B	5
Toluene	8260B	5
Xylene ^d	8260B	5
Semi-Volatile Organic		
Benzenethiol	8270C	10
2,4-Dimethylphenol ^e	8270C	10

^a - Permittee shall use the most current, equivalent EPA method (I.F.13b).

^b - Method Detection Limit reported as $\mu\text{g/L}$ unless noted.

^c - Preserved with sulfuric acid. This converts nitrite to nitrate, but the total Nitrogen remains the same, and is consistent with the Permit's intent of measuring total Nitrogen.

^d - Xylene reported as total ortho-, meta-, and para- isomers.

^e - To be performed only at LWMA-2. Elimination of this sampling analysis shall be considered when a valid trend of certainty can be justified and analytical anomalies cease for three consecutive annual sampling events.

IV.C.3. For those parameters and constituents in Condition IV.C.2 for which no concentration limit is established at the time the Permit is issued, the Permittee shall establish background values in accordance with R315-8-6.8(g). Background water quality is defined as the groundwater quality immediately upgradient and within the RWMA boundary at the time the project was completed. The use of background water quality upgradient of the Chevron property is not relevant in this permit because the RWMA, itself, lies within the operating area of the Facility and is therefore, not surrounded by soil and groundwater that are representative of naturally occurring, non-impacted conditions. The RWMA, along with the entire facility falls within the GWMA, which is subject to separate groundwater monitoring.

IV.C.4. Background groundwater quality for Table IV-1 monitoring parameters or constituents is based on the average of data obtained at each of the four RWMA monitor wells during the first year of quarterly sampling in 1994. As background data, they become the basis against which future analytical results are compared. Due to the availability of the 1994 background data established for the RWMA as concentration limits, and the lack of any significant seasonal-based variations of any Table IV-1 parameter or constituent, annual sampling will adequately monitor for a release from the RWMA and still satisfy the data requirements for the selected statistical method required in Condition IV.E (R315-8-6.8(g)). Therefore, annual sampling shall be implemented at the RWMA by the Permittee pursuant to Condition IV.H.3 upon approval of this Permit by the Executive Secretary.

IV.D. GROUNDWATER MONITORING REQUIREMENTS

IV.D.1. All monitor wells shall be constructed in accordance with the provisions in Condition IV.D.10.

IV.D.2. The groundwater monitoring program shall include sampling and analysis procedures defined in R315-8-6.8(d) and (e). Any modifications shall be submitted to the Executive Secretary for review and approval following Condition I.D.2.

IV.D.3. The Permittee shall follow the requirements for measurement of the groundwater surface elevation of R315-8-6.8 (f).

IV.D.4. If the Executive Secretary receives information indicating that the surveyed well apron elevations of the wells in the groundwater system(s) as specified in Conditions IV.A.5 and Attachment 1 are inadequate, the Executive Secretary shall require the Permittee to resurvey any or all of these well apron elevations.

- IV.D.5. The Permittee shall notify the Executive Secretary orally or in writing at least fifteen (15) working days prior to any sampling event required under this permit.
- IV.D.6. The Permittee may add new monitor wells as part of the monitor well system only upon approval of the Executive Secretary. Approval for changes to the monitor well system shall constitute a permit modification (except when replacing damaged monitor wells already in the permit). The Permittee shall follow the procedures specified in Condition I.D.2 for modification of the permit.
- IV.D.7. The Permittee must at all times maintain a monitor well system as specified in Condition IV.A.4. The compliance point monitor wells listed in Condition IV.A.4 may not be removed from the monitor well system without approval of the Executive Secretary and submitting a permit modification as outlined in Condition I.D.2.
- IV.D.8. The Permittee shall provide for the proper disposal of contaminated groundwater generated during groundwater monitor well sampling and during the development of any new monitor well. Purge and development water shall be placed into labeled drums and be disposed of as outlined in Attachment 1. Typically, purge and development water is disposed of into the Facility wastewater treatment system.
- IV.D.9. The Permittee shall monitor and sample all groundwater monitor wells for the presence of hazardous constituents identified in Condition IV.C. The monitor wells shall be sampled at a frequency and in a manner consistent with Condition IV.C and IV.F.2.
- IV.D.10. The Permittee shall locate, install, construct, and maintain new groundwater monitor wells as specified in the Technical Enforcement Guidance Document (TEGD), OSWER-9950.1, September 1986, or the most recent version. All monitor wells shall be cased in a manner that maintains the integrity of the monitor well bore hole. The casing shall be screened or perforated and packed with gravel or sand where necessary, to enable collection of accurate groundwater samples. The annular space above the sand pack must be sealed to the surface to prevent the potential for a contamination pathway from surface sources.
- IV.D.11. The Permittee shall construct and maintain new monitor wells in accordance with plans and specifications to be submitted to the Executive Secretary for approval. The Executive Secretary will approve in writing the following: number, location, depth, and design of all new monitor wells prior to installation. The Permittee shall follow the procedures specified in Condition I.D.2 for permit modifications.

- IV.D.12. Additional groundwater monitor wells shall be installed to maintain compliance if subsurface conditions significantly change after permit issuance. Such changes may include, but are not limited to, water level elevation or apparent flow direction changes, or detection of one of the hazardous constituents in a monitor well. If hazardous waste constituents exceeding the groundwater protection standard concentration limits, as defined in Condition IV.C of this Module, are detected in the furthestmost hydraulically downgradient monitor well, the Permittee shall install additional groundwater monitor wells further downgradient.
- IV.D.13. Upon notification by the Executive Secretary in writing or as a result of a compliance action the Permittee may be required to install and sample additional monitor wells at any time during the post-closure or compliance period if new information or unforeseen circumstances reveal a need for additional monitoring to protect human health and the environment.
- IV.D.14. The Permittee shall submit monitor well completion reports which include boring logs, standard penetration tests, all analytical tests performed on soils, water level elevations, groundwater contour maps, monitor well development results including recharge rates, cross sections or fence diagrams as well as all other data, to be submitted within ninety (90) days after completion of the monitor wells which are installed after permit issuance.
- IV.D.15. Existing monitor wells shall be maintained in a fully operational condition for the duration of this permit. The Permittee shall notify the Executive Secretary within seven (7) days when a monitor well is no longer properly functioning or providing credible data. These conditions would include, but are not limited to, the presence of sediment, cracked or damaged well casing, protective steel casing, damaged concrete apron, etc. The Permittee shall submit to the Executive Secretary for approval the specific conditions for replacement or correction of an improperly operating monitor well.
- IV.D.16. The Permittee shall, on an annual basis measure the depth to the bottom of the RWMA groundwater monitor wells to the nearest one-tenth (0.1) feet. This information shall be recorded on monitor well purging volume calculation sheets. If a problem is discovered, the Permittee shall follow the procedures described above in Condition IV.D.15 regarding notification and corrective procedures.

- IV.D.17. The Executive Secretary shall approve the permanent removal of any monitor well listed in IV.A.4 and Attachment 1, or any monitor wells installed after permit issuance following the permit modification procedure of Condition I.D.2.
- IV.D.18. The Permittee shall use the following techniques and procedures when obtaining samples and analyzing samples to ensure reliable monitoring results from the groundwater monitor wells as required in R315-8-6.8(d):
- IV.D.18.a. Collect samples from all monitor wells shall in the order and by the techniques described in the Water Data Collection Quality Assurance Plan located in Attachment 1;
- IV.D.18.b. Preserve all samples in accordance with the respective EPA Method and transported under chain of custody to the analytical laboratory in accordance with the procedures specified in the approved Water Data Collection Quality Assurance Plan in Attachment 1; and
- IV.D.18.c. Analyze all samples according to test methods identified in Condition IV.C.
In addition:
- IV.D.18.c.i. Establish and implement, for each sampling event under the groundwater monitoring program, quality assurance and quality control (QA/QC) procedures in full detail in accordance with the approved Water Data Collection Quality Assurance Plan in Attachment 1;
- IV.D.18.c.ii. The Executive Secretary may request at any time all laboratory QA/QC documentation and supporting data on any sampling event. The raw organics information for required sampling and analysis, including organics gas chromatographic printouts, mass spectral analyses, and QA/QC surrogate and spike results shall be retained by the refinery's Contract laboratory and/or the refinery throughout the post-closure care period; and
- IV.D.18.c.iii. In case of loss of sample integrity (i.e. breakage, loss), re-sampling shall take place within seven (7) days of notification of the loss and be conducted as outlined in Attachment 1.
- IV.D.19. The Permittee shall determine the elevation of the groundwater surface at each monitor well within seven (7) days of sampling each monitor well. Water levels shall be collected within twenty four (24) hours from measuring the first monitor well to measuring the last monitor well.

IV.D.20. For each monitor well the Permittee shall prepare a geologic and monitor well completion log. The Permittee shall survey and record on the log the top of casing elevation for each monitor well as it is installed. This elevation shall become the reference for determining the groundwater surface elevation at each respective monitor well.

IV.E. STATISTICAL PROCEDURES

IV.E.1. Within sixty (60) days of completing the first round of annual sampling (of newly established monitor wells) as outlined in Condition IV.F.2, the Permittee shall select and submit to the Executive Secretary for review and approval, one of the statistical methods outlined in R315-8-6.8(h) to be used for evaluating groundwater monitoring data for each hazardous constituent. The method which has been approved by the Executive Secretary is in Attachment 4. This statistical method shall be conducted for each hazardous constituent in each monitor well.

IV.E.2. The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents.

IV.E.3. Hydrogeologic conditions at the RWMA dictate that a trend analysis such as the Mann Kendall is the most appropriate statistical comparison. Therefore, this individual monitor well trend analyses will be used in lieu of other statistical methods in accordance with R315-8-6.8(h)5.

IV.E.4. Trends will be determined using a 95% confidence level ($\alpha = 0.05$).

IV.E.5. At the time the Permit was issued, the total sample population at the RWMA was less than 40. Thus, the equation specified in the Mann Kendall methodology for small sample populations is appropriate. However, when the total sample population exceeds 40, the equation for larger sample populations shall be used.

IV.E.6. While trends will be developed for each specific monitor well, with no statistical comparison to the other RWMA monitor well data, the individual trends at each RWMA well shall be compared as part of the overall evaluation of RWMA water quality data.

IV.E.7. The selected statistical method shall follow R315-8-6.8(a)(1)(i) where applicable.

IV.F. MONITORING PROGRAM AND DATA EVALUATION

- IV.F.1. The Permittee shall collect, preserve, and analyze samples pursuant to Condition IV.D.18.
- IV.F.2. The Permittee shall determine groundwater quality at each monitor well at the compliance point annually during the post-closure care period of the RWMA. The Permittee shall express the groundwater quality at each monitor well in a form necessary for the determination of statistically significant increases in trends using the methods outlined in IV.E.3.
- IV.F.3. The Permittee shall determine the groundwater flow direction at the RWMA in the uppermost aquifer as required by R315-8-6.9(e). This information shall be included in the annual report specified in Condition IV.H.3.
- IV.F.4. During data analysis from each sampling event, the Permittee shall determine whether there is a statistically significant increase in the trend in each individual monitor well for the parameters identified in Condition IV.C. In determining whether such an increase has occurred, the Permittee must compare the groundwater quality at each monitor well specified in Condition IV.A.4 to the background value at each respective monitor well using the method specified in Condition IV.E.3. An upward trend indicated by a single detection of a Table IV-1 parameter would first be re-validated to confirm if there was sampling or laboratory errors that may have resulted in an invalid result. Depending on those findings, the following conditions shall apply:
- IV.F.4.a. If errors are confirmed, or suspected to have occurred in the lab or field, all related QA/QC information shall be reviewed to determine if an accurate value for the parameters in question can be obtained. If new value(s) can be obtained, they shall be incorporated into the same data set. If not, the parameters involved shall be reviewed as to whether the well should be re-sampled immediately, or if waiting until the next annual sampling event would not jeopardize water quality reporting issues for the event.
- IV.F.4.b. If it is re-sampled, the new sample(s) shall be analyzed for all or part of Table IV-1 as directed by the Executive Secretary, thus superceding the original sample results. The result of the re-sampling will direct what further action, if any, is to be taken pursuant to Condition IV.G.

IV.F.5. The Permittee shall perform the evaluations described in Condition IV.F.4 within sixty (60) days after completion of the original sampling event. If re-sampling is required pursuant to Condition IV.F.4.b, the Permittee shall notify the Executive Secretary at least seven (7) days prior to the planned re-sampling event. Additionally, the reporting schedule in Table IV-2 will be delayed by sixty (60) days due to the additional sampling, analytical and data evaluation time involved in the re-sampling.

IV.G. SPECIAL REQUIREMENTS IF SIGNIFICANT INCREASES OCCUR IN VALUES FOR PARAMETERS OR CONSTITUENTS

IV.G.1. If the Permittee determines, pursuant to Condition IV.E. that there is a statistically significant increase above the background values for any of the indicator parameters specified in Condition IV.C., the Permittee shall:

IV.G.1.a. Notify the Executive Secretary in writing within seven days as referenced in R315-8-6.9(g)(1);

IV.G.1.b. Within seven (7) days after the written notification sample the groundwater in all RWMA wells and determine the concentration of all plausible and potential constituents identified in R315-50-14 (40 CFR 264, Appendix IX), according to R315-8-6.9(g)(2) as directed by the Executive Secretary; and

IV.G.1.c. Within 90 days, submit to the Executive Secretary an application for a permit modification to establish a compliance monitoring program as referenced in R315-8-6.9(g)(4). The application must include the following information:

IV.G.1.c.i. An identification of the concentration of all applicable Appendix IX constituents found in the groundwater at each monitor well at the compliance point according to R315-8-6.9(g)(4)(i).

IV.G.1.c.ii. Any proposed changes to the groundwater monitoring system at the facility necessary to meet the requirements of compliance monitoring as described in R315-8-6.10 according to R315-8-6.9(g)(4)(ii).

IV.G.1.c.iii. Any proposed changes to the monitoring frequency, sampling and analysis procedures, or methods or statistical procedures used at the facility necessary to meet the requirements of R315-8-6.10 as referenced in R315-8-6.9(g)(4)(iii).

- IV.G.1.c.iv. For each hazardous constituent found at the compliance point, a proposed concentration limit from existing background data, or a notice of intent to seek an alternate concentration limit for a hazardous constituent shall be used according to R315-8-6.9(g)(4)(iv).
- IV.G.2. Within 180 days of the submission of alternate concentration limits for the hazardous constituents, the Permittee shall submit all data to support the alternate concentration limit proposed and a corrective action feasibility plan that meets the requirements of Module V according to R315-8-6.9(g)(5).
- IV.G.3. If the Permittee determines, pursuant to Condition IV.F., using the Mann Kendall Test, or equivalent, that there is a statistically significant increase above RWMA monitoring well background values for the parameters specified in Condition IV.C., he may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from an error in sampling, analysis, or evaluation. In such cases, the Permittee shall:
- IV.G.3.a. Notify the Executive Secretary in writing within seven (7) days that he intends to make a demonstration according to R315-8-6.9(g)(6)(i).
- IV.G.3.b. Within 90 days, submit a report to the Executive Secretary which demonstrates that a source other than a regulated unit caused the increase, or that the increase resulted from an error in sampling, analysis, or evaluation according to R315-8-6.9(g)(6)(ii).
- IV.G.3.c. Within 90 days, submit to the Executive Secretary an application for a permit modification to make any appropriate changes to the detection monitoring program at the facility according to R315-8-6.9(g)(6)(iii).
- IV.G.3.d. Continue to monitor in accordance with the detection monitoring program at the facility according to R315-8-6.9(g)(6)(iv).

IV.H. RECORD KEEPING AND REPORTING

- IV.H.1. The Permittee shall enter all monitoring, testing, and analytical data obtained in accordance with Condition IV.D the operating record as required in R315-8-5.3. The data shall include all computations, calculated means and results of all statistical tests required by Condition IV.E.
- IV.H.2. The established background values and the computations necessary to determine background values must be submitted to the Executive Secretary. A record of data

and trends in each well for the relative constituents in Table IV-1 must also be maintained.

- IV.H.3. The Permittee shall submit the analytical results required by Conditions IV.D.18 through 20 and the results of the statistical methods (as referenced in Attachment 4) required by Conditions IV.E and IV.F.4 in accordance with the following schedule:

**TABLE IV-2
SCHEDULE OF COMPLIANCE**

Annual Duration	Annual Sampling Event	Report Due Date to Executive Secretary
January – December	July or August	October 31
January – December	Re-Sample Under Condition IV.F.4.	December 31

IV.I. ASSURANCE OF COMPLIANCE

- IV.I.1. The Permittee shall assure the Executive Secretary that groundwater monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard under R315-8-6.3 are taken during the term of the Permit.

IV.J. REQUEST FOR PERMIT MODIFICATION

- IV.J.1. If the Permittee or the Executive Secretary determines that the detection monitoring program no longer satisfies the requirements or intent of the regulations, the Permittee shall, within ninety (90) days of the determination, submit an application for a permit modification to make any appropriate changes to the program which will satisfy the regulations required to R315-8-6.9(h).